



USAID
FROM THE AMERICAN PEOPLE

Hydropower Investment Promotion Project (HIPP)

MEMORANDUM

**ON METHODOLOGIES APPLICABLE TO THE ALLOCATION
OF CAPACITY ON THE AKHALTSIKHE TO BORCKA
INTERCONNECTION**

Monday, September 6, 2010

This publication was produced for review by the United States Agency for International Development. It was prepared by Deloitte Consulting in collaboration with Black & Veatch and Pierce Atwood Attorneys LLC.

MEMORANDUM

ON METHODOLOGIES APPLICABLE TO THE ALLOCATION OF CAPACITY ON THE AKHALTSIKHE TO BORCKA INTERCONNECTION

USAID HYDROPOWER INVESTMENT PROMOTION PROJECT
(HIPP)

CONTRACT NUMBER: EEM-I-00-07-00005-0

DELOITTE CONSULTING LLP

IN COLLABORATION WITH BLACK & VEATCH AND
PIERCE ATWOOD ATTORNEYS LLC.

USAID/CAUCASUS OFFICE OF ENERGY AND ENVIRONMENT
SEPTEMBER 6, 2010

DISCLAIMER:

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

This document was prepared by

Author	Organization	Contact Details
O. Julia Weller	Pierce Atwood LLP	jweller@pierceatwood.com 1.202.470.6423
Robert Taylor	Pierce Atwood LLP	Rtf10@hotmail.com 1.201.925.8633

MEMORANDUM

ON METHODOLOGIES APPLICABLE TO THE ALLOCATION OF CAPACITY ON THE AKHALTSIKHE TO BORCKA INTERCONNECTION

EXECUTIVE SUMMARY

One of the issues that has arisen with respect to the Akhaltsikhe to Borcka transmission line (and any other lines that may be developed between Georgia and Turkey in the future) is how capacity on the interconnection should be allocated at the outset of commercial operations and how it should be allocated in the event of congestion. The Ministry of Energy in Georgia (“Ministry”) has suggested that initial capacity on the Georgian side of the interconnection with Turkey should be allocated on a first-come first-served basis (i.e., granted on the basis of an application, to the first hydropower plants (“HPPs”) to reach commercial operations). In the event of congestion, the Market Rules currently provide for a ranking of contracts, with the highest price electricity receiving the highest priority. Turkey’s Ministry of Energy and Natural Resources (“MENR”) and Turkey’s transmission system operator TEIAS have not yet decided on whether to continue the current one-year allocation of capacity on the Turkish side of the border with Georgia or whether to adopt the same allocation procedures as will be used on the interconnections with Greece and Bulgaria once TEIAS begins synchronized operations on a trial basis with those countries.

This Memorandum reviews the obligations of both the Government of Georgia (“GoG”) and the Government of Turkey (“GoY”) in the context of:

- (1) The Action Plan for Regulatory Environment (“Action Plan”) agreed upon by the GoG with the EBRD, EIB and KfW in connection with the loan for construction of the Akhaltsikhe to Borcka line;
- (2) Turkey’s accession to the European Union (“EU”) and its tentative accession to the Energy Community Treaty (“EnC Treaty”);
- (3) Cases interpreting the exemption from the obligation to provide non-discriminatory third-party access (“TPA”) to cross-border interconnections; and

(4) Turkey's future synchronous operations with the European network in accordance with the rules of the European Network of Transmission System Operators for Electricity ("ENTSO-E").

Based on a review of the foregoing, this Memorandum concludes that while the ENTSO-E rules apply only to synchronous interconnections, both parties are required to comply with the major principles of the EnC Treaty and the *acquis communautaire*. However, the Akhaltsikhe to Borcka line qualifies for the exemption from TPA available to new interconnectors, subject to the kind of conditions imposed in prior cases on other new interconnectors. They include allowing secondary trading of interconnector capacity, limiting the price that sellers can receive for capacity that they resell, use-it-or-lose-it arrangements, and setting a cap on capacity available to any one party.

ISSUES

Georgia's Ministry of Energy is currently in negotiations with potential investors in hydropower projects which total over 2500 MW. The anticipated capacity of the Borcka interface is 650 MW. Georgia may therefore face congestion issues with respect to the Borcka interconnection. It will have to manage those issues taking into account its status as an observer of the EnC Treaty, as well as Turkey's ever-deepening relationship with the EU. Turkey, for its part, will have to manage its interconnection with Georgia taking into account its obligation to implement the *acquis* on energy as an accession country to the EU, possible accession to the EnC Treaty and its synchronized operations with ENTSO-E. Of particular relevance here are rules governing the interconnection of synchronous and non-synchronous connections, congestion management rules, TPA and exemptions from TPA for "new interconnectors" meeting certain requirements. Specific questions relevant to the Borcka interconnection include:

- Are the ENTSO-E Rules in the Handbook applicable to synchronous interconnections also applicable to asynchronous interconnections?
- Are the European Commission's Directives and Regulations applicable to the Akhaltsikhe-Borcka line?
- Does the exemption for new interconnections apply to the Akhaltsikhe to Borcka line?

- What is the best way forward?

ISSUE 1: DOES THE ENTSO-E HANDBOOK DICTATE THE ALLOCATION OF CAPACITY ON ASYNCHRONOUS INTERCONNECTIONS?

THE ROLE OF ENTSO-E

ENTSO-E merged with and succeeded its precursor, the Union for the Co-ordination of Transmission of Electricity (“UCTE”) in July 2009. The ENTSO-E system is synchronously operated. To ensure smooth system operation, regulatory authorities that are members of ENTSO-E are required to comply with a number of technical rules and recommendations on operations. These rules and recommendations provide the minimum requirements for grid operation on the ENTSO-E system. These rules and recommendations, located in the ENTSO-E Handbook, seek to:

- leverage the exchange of electric power beyond the boundaries of the separate countries that form the ENTSO-E interconnected system; and
- promote the non-discriminatory exchange of data for this task.

THE ENTSO-E HANDBOOK

The ENTSO-E Operation Handbook (“The Handbook”) was developed by UCTE and has been binding on Member States since the end of 2004. It was adopted by ENTSO-E upon its taking over the functions of UCTE in July, 2009. The Handbook is intended to establish a comprehensive set of technical standards and recommendations and to ensure continued secure operation of the ENTSO-E Continental European Grid. Toward that end, the Handbook provides policies, rules and recommendations on the following subjects:

- Load-Frequency Control and Performance;
- Scheduling and Accounting;
- Operational Security;

- Coordinated Operational Planning;
- Emergency Operations;
- Communication Infrastructure;
- Data Exchanges; and
- Operational Training.

Standards for customer access to the network, network tariffs, accounting, the commercial aspects related to unintentional deviations, billing procedures and market rules, as well as other standards that may be set by national Grid Codes, laws or contracts, are not within the scope of the Operation Handbook.

Although the ENTSO-E rules are intended to be comprehensive within its sphere of application, they are not intended to be dispositive of national rules. This is because the vastness of the ENTSO-E area and the unique attributes of transmission systems operating within it make it impossible for ENTSO-E to deal with every unique characteristic in every system. In addition, the ENTSO-E rules specifically provide transmission system operators (“TSOs”) the authority to implement more stringent requirements than those found in the ENTSO-E rules. For these reasons the ENTSO-E rules can be considered as being a threshold rather than a ceiling for rules for governing grid operation. On this basis, individual TSOs and regional TSO associations have developed Grid Codes that define the sharing of responsibilities for the systems on matters including:

- security of supply;
- reliability; and
- profitability.

Congestion management methods that have been developed in recent years are in most cases border specific and differ significantly from one another. The Handbook briefly addresses congestion management issues, (in section P 4), but its focus is mainly on the need for communication between affected TSOs and for planning purposes. It is silent on allocation of capacity for new interconnectors. The terms “synchronous” and “non-synchronous” are also not found in the Congestion Management Guidelines, presumably because the ENTSO-E system is synchronous and there are no non-synchronous

connections within the ENTSO-E system. Since the Handbook is intended to apply only to the ENTSO-E system, it does not determine the allocation of capacity or the management of congestion on asynchronous connections. The allocation of capacity on asynchronous interconnections is therefore governed by international agreement between the border countries and any treaties to which they are a party.

ISSUE 2: ARE THE EUROPEAN COMMISSION'S DIRECTIVES, REGULATIONS AND CONGESTION MANAGEMENT GUIDELINES APPLICABLE TO THE AKHALTSIKHE TO BORCKA LINE?

Neither Georgia nor Turkey is a member of the European Union. However, both countries have made commitments to comply in some respects with the European Commission's energy Directives and Regulation (EC) No. 714/2009. The EU opened accession negotiations with Turkey on 3 October 2005 and reported in 2009 that Turkey has made significant progress in the development of its electricity sector. It has successfully engaged in a comprehensive reform of its electricity market and in gradually opening it to competition. Turkey has also been an observer to the EnC Treaty since November 2006 has formally expressed interest in full membership in the Energy Community. The first round of negotiations for full membership in the Energy Community took place in September 2009.

Georgia became an observer in December 2007 but has not formally expressed an interest in full membership. However, in 2009, Georgia committed to an Action Plan for Regulatory Environment for the Black Sea Transmission Project. In that Action Plan it agreed to implement certain measures within a two-year period, including amending its Market Rules to prioritize renewable energy and using explicit auctions to allocate congested capacity on interconnections. It also agreed to amend its laws to comply with the Third Package as it relates to congestion management. On the longer term, it agreed within a five-year period to work towards establishing an independent system operator and to undertake certain other commitments when it becomes a member of the EnC Treaty.

Thus, while neither country is yet wholly within either the EnC Treaty or the EU, each has committed to certain key principles. Specifically, Georgia has agreed to the principles in Regulation (EC) No. 714/2009 ("Regulation") related to the allocation of capacity on interconnectors and to the Guidelines on the Management and Allocation of Available

Transfer Capacity of Interconnections Between National Systems (“CMG”) contained in the Annex to that Regulation, while Turkey, by virtue of becoming an ENTSO-E member, is harmonizing its market rules and regulations with that of the EU.

The Regulation requires border countries to set available capacity at “maximum” levels¹ consistent with the safety standards of secure network operations, to coordinate in the allocation of cross-border capacity through non-discriminatory market-based solutions while paying attention to the merits of implicit auctions for short-term allocations,² and to use common allocation procedures.³ It also contains references to TPA, a bedrock principle of the *acquis communautaire* on energy.⁴

ISSUE 3: DOES THE EXEMPTION TO THIRD PARTY ACCESS RULE FOR NEW INTERCONNECTORS APPLY TO THE AKHALTSIKHE TO BORCKA LINE?

The “Third Package” of reforms related to creation of an internal electricity market is currently being considered for adoption by the Permanent High Level Group of the Energy Community. The Third Package made a number of changes to the Directives and regulations governing network access, in particular with respect to creating network codes to manage effective and transparent access to transmission networks across borders and to ensure coordinated planning for interconnection capacities. Regulation (EC) No. 1228/2003 was repealed and replaced by Regulation No. 714/2009. Many provisions of the earlier regulation, however, did not change. Similarly, many provisions of Directive 2003/54/EC were retained in Directive 2009/72/EC. Of particular relevance for the issue of allocation of capacity are the provisions regarding third party access and the exceptions for new interconnectors. These provisions were retained in all major respects. Thus, interpretive decisions made under the previous Directive and Regulation with respect to the exemptions for new interconnectors continue to be instructive.

Exemptions from certain provision of the Directive are provided in Article 17 of the Regulation, which states that, upon request, a new interconnector **may be exempted** from the requirements of:

¹ Regulation, Article 15(3)

² Regulation, Article 12(2)

³ CMG, Article 3.1

⁴ Directive 2009/72/EC (“the Directive”)

- Article 16(6) of the Regulation; and
- Articles 9, 32 and 37(6) and (10) of Directive 2009/72/EC.

Article 16(6) of the Regulation requires congestion-related income to be used to maintain or increase interconnection capacity and to relieve existing congestion. Article 9 of the Directive requires the unbundling of transmission systems from TSOs, while under Article 32, Member States are required to ensure third party access. Article 37(6) requires regulators to approve, *inter alia*, the procedures for allocation of capacity on interconnectors and the methods for congestion management. Article 37(10) gives regulators the authority to, *inter alia*, fix or approve transmission tariffs and methodologies.

EXEMPTION CRITERIA

The exemptions under Article 17 of the Regulation are available only under certain conditions. Those conditions are:

- (a) the investment will enhance competition in electricity supply;
- (b) owing to the level of risk attached to the investment, the investment would not take place in the absence of the grant of an exemption;
- (c) the interconnector is owned by a natural or legal person which is legally separate from the system operators in whose systems the interconnector will be built;
- (d) users of the interconnector will be charged a fee for the interconnection services;
- (e) since the partial market opening referred to in Article 19 of Directive 96/92/EC, no part of the capital or operating costs of the interconnector has been recovered from any component of charges made for the use of transmission or distribution systems linked by the interconnector;
- (f) the exemption does not damage:
 - competition; or
 - the effective functioning of the internal electricity market; or
 - the efficient functioning of the regulated system to which the interconnector is linked.

These criteria were the subject of a European Commission Staff Working Paper (“EC Staff Paper”), dated 6.5.2009, and have been applied to at least two cross-border electricity transmission interconnectors. They have also been applied in the case of several cross-border natural gas facilities.

The EC Staff Paper notes that there are examples of partial exemptions for new major infrastructure, where only 80% of capacity was exempted from TPA and the remaining 20% was subject to regulated TPA.⁵ Or the exemption applied only to the use of congestion revenues, but not to other requirements in the congestion management guidelines.⁶ The EC Staff Paper also states that in past cases both project developers and national regulators have proposed caps on the amount of capacity that any single party could hold and have also proposed to cap the amount of capacity that any dominant supplier could hold at less than its market share. The purpose of such caps is to provide opportunities for non-dominant competitors to enter the market place. The EC Staff Paper listed possible conditions that could be imposed on a new interconnector to ensure that it enhances competition. In addition to the conditions already discussed, the ones with applicability to electric transmission facilities are:

- A requirement to test market demand and to satisfy interest expressed to the largest possible extent to avoid excessive congestion rents
- A limitation on the validity of the exemption by making it conditional on the project starting operation within a certain time period, to avoid “exemption hoarding”
- A requirement to reserve capacity for short-term contracts to enable the development of a spot market (not a pre-defined percentage but ideally based on respective market demand for short-term capacities)
- A limitation on the exemption duration

The EC Staff Paper also addresses criteria to assess the level of risk and notes that long-term contracts are a legitimate way for project promoters to reduce the economic risk of their investment. However, in the event of long-term contracts, to prevent the foreclosure of competition, use-it-or-lose-it (“UIOLI”) rules and trading on the secondary market should also be applied. Finally, the EC Staff Paper notes that applying the exemption requires coordination between the national authorities.

⁵ The examples given were two Liquefied Natural Gas (“LNG”) terminals in Italy.

⁶ The investor in a transmission line would be allowed to retain the revenues and the regulator could not intervene ex-post facto.

The two examples of cross-border electric transmission facilities are the East-West Interconnector between Ireland and Great Britain, and the Nordic Energy Link between Estonia and Finland. In the case of the East-West Interconnector, the project developer Imera Ltd. sought a full exemption for 25 years for one cable, and 20 years for the other, to allow for financing. The developer also proposed to allocate capacity under an “open season” auction process at the beginning of the project, noting that open seasons have been run in several merchant natural gas projects and LNG terminals. An independent third party would administer the open season over a period of 30 days. Sealed bids would be submitted and to qualify for participation, bidders would have to meet pre-determined creditworthiness standards. Bids would be evaluated and capacity awarded so as to result in the greatest total net present value to the project developer, as determined by evaluating the requested capacity, term of services, price and other commercial factors.

Imera set a “reserve” (or floor) price to be reflective of debt servicing requirements, operating costs and a reasonable rate of return. To prevent withholding of capacity, UIOLI would apply but users would have the opportunity to sell their capacity in the secondary market via explicit auctions, from a year-ahead base load down to an hourly day-ahead market. Upon completion of the open season, Imera planned to publish a report with the identities of the capacity purchasers, the term and the amount of reserved capacity.

The Commission for Energy Regulation of Eire found that the request for exemption met all the criteria for exemption and granted the request, even after Imera changed its application to propose allocating 100 % of the capacity under long term contracts of a minimum of 10 years because of concerns regarding uncertainty of revenues for the uncommitted capacity. Bidders would be required to pay capacity reservation charges so would have an incentive to sell it on the secondary market if they couldn’t use it; otherwise they would receive no compensation for the unused capacity. The Commission set a cap of 70% on the capacity that any one party could contract for, with a 40% cap for any dominant party,

In the case of the Nordic Energy Link, the Minister of Energy of Estonia found that the promoter had met its burden of showing that the interconnector qualified for the exemption from TPA. Here also auctions of unused capacity rights were proposed and the parties to the project could not set a minimum price for UIOLI auctions that exceeded the level required to cover capital costs and justified operating costs.

APPLICATION OF CRITERIA TO AKHALTSIKHE TO BORCKA LINE

Criterion A: The investment in the interconnector enhances competition in electricity supply:

The construction of the new line between Georgia and Turkey will enable Georgian and Turkish generators to compete in each other's markets and expand the number of suppliers available to consumers and the number of consumers available to generators. Competition will therefore clearly be enhanced.

Criterion B: The level of risk attached to the investment is such that the investment would not take place unless an exemption was granted:

The project risks faced by the new line are many, from the capital costs of the project, the construction and technical risks involved in mountainous terrain and the construction of back-to-back converters, the market risks of economies in flux and political risks from changes in governments. All of these combined are sufficient to meet the risk criterion.

Criterion C: The interconnector will be owned by a natural or legal person separate in terms of its legal form from the relevant system operators to whose systems the infrastructure will be connected:

On the Georgian side, at least, this criterion will be met because the new line will be owned by Energotrans, a separate daughter company from GSE. Whether the criterion applies to TEIAS is debatable.

Criterion D: Charges will be levied on users of the interconnector:

The Georgian segment of the interconnector will be paid for exclusively by users of the new line and existing customers of GSE will not be required to subsidize the new line. All capital costs and ongoing operating costs will be recovered from the tariff for the new line.

Criterion E: Since the partial opening referred to in Article 19 of Directive 96/92/EC, no part of the capital or operating costs of the interconnector has been recovered from any component or charge made for the use of transmission or distribution systems linked by the licensee's interconnector:

While a portion of the towers to hold the cables were built before Georgia's independence from the Soviet Union, those costs were sunk over 20 years ago and make up only a fraction of the capital costs of the new lines. The bulk of the assets will be new, in particular the back-to-back converters, and no costs can be said to have been or will be recovered through use of system charges in Georgia.

Criterion F: The exemption is not detrimental to competition or the effective functioning of the internal electricity market, or the efficient functioning of the regulated system to which the interconnector is connected:

The Ministry has stated that it intends to implement the UIOLI principle but has opposed the creation of a secondary market to reallocate unused capacity, for fear of middlemen buying capacity cheaply and reselling it at a profit. In addition, the Ministry wants to allocate capacity on a first-come first-served and does not want to charge a reservation charge. Neither of these latter proposals is likely to lead to efficient allocation of capacity or be beneficial to competition between HPPs within Georgia; indeed the first-come first-serve allocation methodology may well chill investment.

ISSUE 4: WHAT IS THE BEST WAY FORWARD?

Unlike the projects discussed above, construction of the Akhaltsikhe to Borcka line is already underway and no open season was held to gauge interest or determine the appropriate size of the line. As discussed at the outset of this Memorandum, the demand of HPP investors wanting capacity is likely to exceed the capacity currently projected for the new line. There are numerous allocation methods that can be used. An “open season” would have been the most transparent, efficient method to use and could still be used today, even though investors have already executed Memoranda of Understanding with the Ministry for HPP sites. The open season would provide proof to Turkey of the demand for capacity and would provide a basis for negotiating additional cross-border transmission lines and for TEIAS to expand its off-take capacity in the south-east of Turkey.

Even if an open season is not used for the Akhaltsikhe to Borcka line, a number of allocation methodologies can still be applied in the event that capacity is insufficient to accommodate all potential users, from computer-assisted iterative auctions, to pro-rata allocation. If a first-come first-serve allocation procedure is used, under which firm capacity rights are allocated to the first HPPs that execute a transmission agreement, the last HPPs to complete their

feasibility studies may well not get any transmission capacity and will be shut out of the Turkish market. But because no HPP developer could be sure of being ahead of any other developer, developers may be discouraged from going forward with their feasibility studies. This would be particularly true of smaller projects.

To hedge against this possibility, and allow for access to the line by late-comers, a certain percentage of the line could be reserved for short-term sales. Since the prices in the spot market in Turkey have consistently been much higher than the price of power under long-term bilateral contracts, lenders would have no need to fear that the capacity would go unused. Indeed, this capacity is likely to be congested and should be auctioned to the highest bidder, consistent with the market-based principles of the Regulation and the Action Plan. Hoarding of capacity is unlikely to occur if capacity rights holders were required to pay a capacity reservation fee to reserve long-term capacity. They would then want to resell the capacity themselves to recoup their capacity payment. The Ministry, however, has mentioned that a capacity reservation charge would not be required. Whether this would be satisfactory to lenders is unclear.

In September, Turkey will be bound by ENTSO-E rules, recommendations and particularly the Handbook. Turkey is also in EU accession negotiations and may soon be a signatory to the EnC Treaty. As a result, it can be expected that increasingly, all of Turkey's energy policies will be EU compliant. While Georgia's status as an observer of the EnC Treaty would not require compliance with any EU rule or policy, other than what it has agreed to in the Action Plan, Georgia's HPP investors will want to sell into the day-ahead markets ("DAM") in Russia and Turkey. Otherwise, Georgia may find its resources sold in monthly blocks at prices well below what licensed wholesalers will make when they resell that electricity into the DAM and spot market in Turkey. Georgia may therefore wish to begin step-by-step harmonization with at least some of the market rules of its neighbors in order for its HPPs to be able to take advantage of trading in the DAM in Turkey and Russia. The harmonization of Georgia's market rules related to allocation of congested capacity on international interconnections would be one such step.

APPENDIX I

RELEVANT PROVISIONS OF DIRECTIVE 2009/72/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 13 JULY 2009 (“INTERNAL MARKET ELECTRICITY RULES”)

Article 32

Third party access

1. Member States shall ensure the implementation of a system of third party access to the transmission and distribution systems based on published tariffs, applicable to all eligible customers and applied objectively and without discrimination between system users. Member States shall ensure that those tariffs, or the methodologies underlying their calculation, are approved prior to their entry into force in accordance with Article 37 and that those tariffs, and the methodologies — where only methodologies are approved — are published prior to their entry into force.²

2. The transmission or distribution system operator may refuse access where it lacks the necessary capacity. Duly substantiated reasons must be given for such refusal, in particular having regard to Article 3, and based on objective and technically and economically justified criteria. The regulatory authorities where Member States have so provided or Member States shall ensure that those criteria are consistently applied and that the system user who has been refused access can make use of a dispute settlement procedure. The regulatory authorities shall also ensure, where appropriate and when refusal of access takes place, that the transmission or distribution system operator provides relevant information on measures that would be necessary to reinforce the network. The party requesting such information may be charged a reasonable fee reflecting the cost of providing such information.

APPENDIX 2

ENTSO-E AND THE OPERATION HANDBOOK

Even though ENTSO-E has developed and published in the ENTSO-E Operation Handbook (“the Handbook”) a number of technical and organizational rules, the obligations of national TSOs are, to a large extent still determined by their own rules and guidelines. Therefore, over and above the **ENTSO-E** rules it is necessary for each country to define its specific requirements. This is because grid structures vary from country to country in:

- the way that generating and distribution units are spread over the area of the country; and
- the way energy is exchanged with other transmission systems by way of interconnected power lines.

Bilateral agreements between contiguous countries aimed at:

- improving or building new interconnecting infrastructure; and
- operating such infrastructure by islanding a small part of the network of one country and attaching it to the system of the other country;

are sometimes used may as a temporary, though not completely efficient, method of cooperation (emphasis added). This method has been used in numerous cases, including:

- In perhaps the most famous instance, in the Ukraine, the thermal power station of Burshtyn together with the substation of Mukacevo have been separated (islanded) from the rest of the Ukrainian system and, together with the necessary interconnecting lines, have been attached to the Rossiori substation of the Romanian system and to the Velke Kapusany and Sajoszoged substations of the Hungarian system, thus injecting power to UCTE.
- Poland has several “island” connections with Belarus and Ukraine, but they are at distribution level (110kV), so mainstream transmission congestion management rules may not apply.

- In Bulgaria, the thermal power station Maritsa Istok 3 has, in the past, been islanded and attached to the Turkish power system.

The European Union's Congestion Management Guidelines⁷ require international interconnections to be managed by way of daily, weekly, monthly, or annual auctions. If and when Georgia becomes a signatory to the Energy Community Treaty, it will have to comply with the Guidelines as well as the rest of the *acquis* energy.

Every TSO in the **ENTSO-E** interconnected synchronous network has obligated itself to follow the technical standards and procedures that are comprised in the Handbook, and this is, in fact its main focus. The Handbook therefore serves as the reference for all grid operators within the UCTE synchronous network. UCTE does not bind Georgia or Turkey, yet.

System safety is the primary goal of the operation of the interconnected network. In an interconnected system there exist numerous inter-dependencies of the networks forming part of the system. In addition, there are impacts that are attributable to the usage of the system by market participants. In an unbundled environment, network operators are not allowed to interfere with market forces unless system safety is at stake.

The operation of the interconnected network is based on the principle that each market participant is responsible for its own network. In order to make that principle practicably workable, the Handbook also defines various types of co-operation where factors outside a TSO's area of control reduce its ability to operate its system within the operating limits established by **ENTSO-E**. To harmonize the operations of the interconnected network, **ENTSO-E** has developed or adopted rules promulgated by its precursor, UCTE (the Union for the Co-ordination of Transmission of Electricity), instructions and suggestions, which TSOs must refer to in order to ease system inter-operability.

As mentioned, TSOs are responsible for the security of their own networks. The most relevant rules for the security of interconnected operation govern the functioning of interconnections. In a cooperative way, TSOs continuously adapt common rules for inter-operability. These are applied mainly at the borders of their control areas (usually at national borders). These rules create favorable conditions for cross-border exchanges by users and by the TSOs themselves. These co-coordinating rules complement other existing national

⁷Commission decision of xxx amending the Annex to Regulation (EC) no 1228/2003 "On conditions for access to the network for cross-border exchanges in electricity."

commitments (legal and contractual) regarding access to transmission networks. The TSOs remain responsible for the performance of facilities connected to the network.

ENTSO-E **policies** identify the requirements for securely operating a transmission system. Each TSO is responsible to establish procedures for reliable operation over a reasonable future time period, taking into account real-time conditions and the time required to prepare such procedures. ENTSO-E policies therefore adopt the so-called “N-1 principle” the goal of which is to ensure that TSO prevent any one incident that might cascade in such a way as to cause an effect beyond its borders. The N-1 principle is intended to prevent an emergency arising as a result of a combination of events. Coordination between TSOs will contribute to enhance a TSO’s ability:

- to cope with risks resulting from the operation of interconnected networks;
- to prevent disturbances;
- to provide assistance in the event of failures with a view to reducing their impact; and
- to provide resetting strategies after a collapse.

The Handbook’s operational security policies address:

- the N-1 Security Principle (operational planning and real time operation);
- various types of contingencies;
- regional approaches;
- operating limits;
- remedial actions;
- voltage control and reactive power management;
- short circuit currents; and
- angle stability.

The Handbook’s policies on emergency operations address:

- system operations in insecure conditions; and
- system restoration after collapse.

APPENDIX 3

DC LINKS AND CONVERTERS

HVDC (High Voltage Direct Current) is a viable alternative when synchronous AC connections are difficult or impossible to implement due the use of different system frequencies in the systems to be interconnected or other important system differences. On advantage of DC converters is that they can reduce the number of 'islands' that must be maintained in isolation. DC ties between different AC systems deliver some of the benefits of interconnection while avoiding many of the technical problems of synchronous operation. There are two general types of asynchronous interconnection:

- HVDC transmission over some distance, between two converter stations connected at either end to an AC system; and
- HVDC “back-to-back” interconnection to AC systems on either side, without any intervening transmission. Back-to-back connections have sometimes served as a stepping stone to a later full synchronous interconnection.

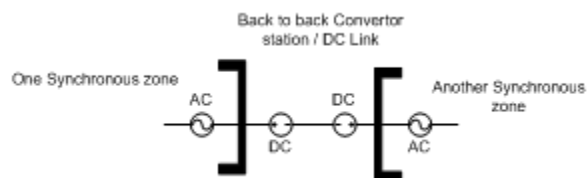
They are used for among others, the following reasons:

- HVDC carries more power for a given conductor size. As a result, in situations where existing transmission capacity is constrained, HVDC is an alternative to an AC transmission upgrade.
- To provide a given transmission capacity, HVDC lines, towers, and rights-of-way can be smaller than a comparable AC system, reducing the line's environmental footprint.
- The solid-state controls of HVDC systems offer complete control over the direction of power flow, without unpredictable loop flows. The direction of flow can be reversed, and operating voltages can be reduced if necessary.

The track record of HVDC indicates high reliability and availability, and the advantage that in a bipolar system one pole can operate one pole if the other pole is not operational due to maintenance or an outage. Also, HVDC does not increase fault currents in the network it is

connected to, so new circuit breakers not required in the rest of the system. HVDC systems, however, are difficult to operate with more than two, or at most three, terminal connections to AC transmission systems, so that HVDC systems are not an optimal choice if power is to be supplied to several intermediate locations along a power line route.

The connection looks like this.



USAID Hydropower Investment Promotion Project (USAID-HIPP)

Deloitte Consulting Overseas Projects - HIPP

36 a Lado Asatiani Street

Tbilisi, 0105, Georgia